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Phosphate Solubilization Potentials of Rhizosphere Isolates from Central Anatolia (Turkey)

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Plant available-phosphorus (P) is usually low in Anatolian soils due mainly to the precipitation as calcium (Ca) and magnesium (Mg) phosphates in alkaline conditions. Phosphate solubilizing microorganisms (PSM) can enhance plant P-availability by dissolving the hardly soluble-P within the rhizosphere, which is the zone that surrounds the plant roots. PSM's can be used as seed- or soil-inocula to increase plant P-uptake and the overall growth. A total of 162 PSM's were isolated from the rhizosphere of wheat plants excavated from different fields located along a 75 km part of a highway in Turkey. The mean, the standart deviation, and the median for solubilized-P (ppm) in a 24 h culture in a tricalcium phosphate broth were 681, 427, and 400 for glucose; 358, 266, and 236 for sucrose; and 102, 117, and 50 for starch, respectively. There was not a linear relationship between the phosphate solubilized in the liquid cultures and the solubilization index obtained in the Pikovskaya's agar. Nine isolates representing both weak and strong solubilizers [Bacillus megaterium (5), Bacillus pumilis (1), Pseudomonas syringae pv. phaseolica (1), Pseudomonas fluorescens (1), Arthrobacter aurescens (1) as determined by the 16S rRNA gene sequence analysis] were further studied in a five day incubation. Pseudomonas syringae pv. phaseolica solubilized statistically ($P<0.05$) higher phosphate (409 ppm) than all the other strains did. There was not a statistically significant ($P<0.05$) difference in solubilized-P among the Bacillus strains. The pH of the medium fell to the levels between 4 and 5 from the initial neutrality. The phosphate solubilizing strains variably produced gluconic, 2-keto-D-gluconic, glycolic, acetic and butyric acids. The organic acids produced by these microorganisms seem to be the major source of phosphate solubilization in vitro.